CLAIMS

1. A semiconductor device, comprising:

a bumped device having a plurality of conductive bumps formed thereon;

a substrate having a plurality of contact pads distributed thereon and approximately aligned with the plurality of conductive bumps; and

an anisotropically conductive layer disposed between and mechanically coupled to the bumped device and to the substrate, the anisotropically conductive layer electrically coupling each of the conductive bumps with a corresponding one of the contact pads.

2. The semiconductor device of claim 1 wherein the bumped device comprises a bumped die having a plurality of solder bumps formed thereon and the contact pads comprise substantially flat contact pads.

3. The semiconductor device of claim 1 wherein the substrate includes a plurality of pockets disposed therein, the contact pads being at least partially disposed within the pockets and the conductive bumps being at least partially engaged within the pockets.

4. The semiconductor device of claim 1 wherein the substrate includes a plurality of pedestals disposed thereon, the contact pads being at least partially disposed on the pedestals.

5. The semiconductor device of claim 1 wherein the anisotropically conductive layer comprises a thermosetting anisotropically conductive adhesive.

6. The semiconductor device of claim 1 wherein the anisotropically conductive layer comprises a thermoplastic anisotropically conductive adhesive.

7. The semiconductor device of claim 1 wherein the anisotropically conductive layer comprises a suspension material having a plurality of conductive particles.

8. The semiconductor device of claim 7 wherein at least some of the conductive particles are engaged into contact to form a conductive path between each conductive bump and the corresponding one contact pad.

9. An apparatus for testing a bumped device having a plurality of conductive bumps, comprising:

a substrate including a first surface having a plurality of contact pads distributed thereon, the contact pads being substantially alignable with the plurality of conductive bumps; and

an anisotropically conductive layer disposed on the first surface and engageable with the plurality of conductive bumps to electrically couple each of the conductive bumps with a corresponding one of the contact pads.

10. The apparatus of claim 9 wherein the anisotropically conductive layer includes a flexible outer surface engageable with the plurality of conductive bumps.

11. The apparatus of claim 9 wherein the anisotropically conductive layer includes a resilient outer surface engageable with the plurality of conductive bumps.

12. The apparatus of claim 9 wherein the anisotropically conductive layer comprises an anisotropically conductive paste, the solder bumps being at least partially embeddable within the paste.

13. The apparatus of claim 9 wherein the first surface has a plurality of pockets disposed therein, the pockets being alignable with the conductive bumps and sized to at least partially receive the conductive bumps, and the contact pads are at least partially disposed within the pockets.

14. The apparatus of claim 9 wherein the first surface has a plurality of pedestals disposed thereon and alignable with the conductive bumps, the contact pads being at least partially disposed on the pedestals.

15. The apparatus of claim 9, further comprising an alignment device engageable with the bumped device to approximately align the conductive bumps with the contact pads.

16. The apparatus of claim 15 wherein the alignment device comprises an optical alignment device.

17. The apparatus of claim 9, further comprising a bumped device handler engageable with the bumped device for controllably positioning the bumped device into engagement with the anisotropically conductive layer.

18. A method of forming a semiconductor device, comprising:

providing a bumped device having a plurality of conductive bumps formed thereon;

providing a substrate having a plurality of contact pads distributed thereon;

forming an anisotropically conductive layer between the conductive bumps and the contact pads;

approximately aligning the plurality of conductive bumps with the plurality of contact pads; and

engaging the plurality of conductive bumps and the plurality of contact pads with the anisotropically conductive layer to electrically couple each of the conductive bumps with a corresponding one of the contact pads.

19. The method of claim 18 wherein forming an anisotropically conductive layer between the conductive bumps and the contact pads comprises applying an anisotropically conductive paste onto the plurality of contact pads.

20. The method of claim 18 wherein forming an anisotropically conductive layer between the conductive bumps and the contact pads comprises applying an anisotropically conductive paste onto the plurality of conductive bumps.

21. The method of claim 18 wherein forming an anisotropically conductive layer between the conductive bumps and the contact pads comprises applying a film of a thermosetting anisotropically conductive material onto the plurality of contact pads and heating the film.

22. The method of claim 18 wherein forming an anisotropically conductive layer between the conductive bumps and the contact pads comprises heating a volume of thermoplastic anisotropically conductive material, applying the volume of thermoplastic anisotropically conductive material onto the substrate to form a layer on the plurality of contact pads, and cooling the layer.

23. The method of claim 18 wherein forming an anisotropically conductive layer between the conductive bumps and the contact pads comprises exposing a material having a plurality of conductive particles to a magnetic field to create a plurality of anisotropically conductive paths.

24. The method of claim 18 wherein forming an anisotropically conductive layer between the conductive bumps and the contact pads comprises compressing a material having a plurality of conductive particles to create a plurality of anisotropically conductive paths.

25. The method of claim 18 wherein engaging the plurality of conductive bumps and the plurality of contact pads with the anisotropically conductive layer to electrically couple each of the conductive bumps with a corresponding one of the contact pads comprises compressing the anisotropically conductive layer between the plurality of conductive bumps and the plurality of contact pads to form a conductive path between each of the conductive bumps with the corresponding contact pad.

26. The method of claim 18 wherein engaging the plurality of conductive bumps and the plurality of contact pads with the anisotropically conductive layer to electrically couple each of the conductive bumps with a corresponding one of the contact pads comprises contacting the plurality of conductive bumps against the anisotropically conductive layer and contacting the plurality of contact pads against the anisotropically conductive layer.

27. The method of claim 18, wherein the substrate includes a plurality of pockets disposed therein and wherein engaging the plurality of conductive bumps and the plurality of contact pads with the anisotropically conductive layer includes at least partially disposing the conductive bumps within the pockets.

28. The method of claim 18, further comprising at least partially curing the anisotropically conductive layer.

29. The method of claim 28 wherein at least partially curing the anisotropically conductive layer comprises heating the layer to 150° C.

30. The method of claim 28 wherein at least partially curing the anisotropically conductive layer comprises cooling the layer to ambient temperature.

31. The method of claim 28 wherein approximately aligning the plurality of conductive bumps with the plurality of contact pads comprises optically monitoring the alignment of the conductive bumps and the contact pads.

32. A method of testing a bumped device having a plurality of conductive bumps, comprising:

engaging a plurality of contact pads with an anisotropically conductive layer;

engaging the plurality of conductive bumps with the anisotropically conductive layer substantially opposite from and in approximate alignment with the plurality of contact pads;

forming a plurality of conductive paths through the anisotropically conductive layer so that each of the conductive bumps is electrically coupled to one of the contact pads; and

applying test signals through at least some of the contact pads and the conductive paths to at least some of the conductive bumps.

33. The method of claim 32 wherein engaging the plurality of conductive bumps with the anisotropically conductive layer comprises at least partially embedding the conductive bumps within the anisotropically conductive layer.

34. The method of claim 32 wherein engaging the plurality of contact pads with the anisotropically conductive layer comprises contacting the contact pads against a surface of the anisotropically conductive layer.

35. The method of claim 32 wherein forming a conductive path through the anisotropically conductive layer so that each of the conductive bumps is electrically coupled to one of the contact pads comprises compressing the anisotropically conductive layer between the conductive bumps and the contact pads to create a conductive path between each conductive bump and each corresponding contact pad.

36. The method of claim 32 wherein forming a conductive path through the anisotropically conductive layer so that each of the conductive bumps is electrically coupled to one of the contact pads includes at least partially exposing the anisotropically conductive layer to a magnetic field.

37. The method of claim 32, further comprising at least partially curing the anisotropically conductive layer.

38. The method of claim 28 wherein at least partially curing the anisotropically conductive layer comprises forming a flexible outer surface on the anisotropically conductive layer.

39. The method of claim 28 wherein at least partially curing the anisotropically conductive layer comprises forming a resilient outer surface on the anisotropically conductive layer.

40. The method of claim 28 wherein at least partially curing the anisotropically conductive layer comprises heating the anisotropically conductive layer to a temperature of at least 150° C.

41. The method of claim 32, further comprising disengaging the conductive bumps from the anisotropically conductive layer.

42. The method of claim 32 wherein disengaging the conductive bumps from the anisotropically conductive layer comprises heating the anisotropically conductive layer until the anisotropically conductive layer softens and extracting the conductive bumps from the anisotropically conductive layer.

43. The method of claim 32 wherein disengaging the conductive bumps from the anisotropically conductive layer comprises withdrawing the conductive bumps from against an outer surface of the anisotropically conductive layer.

44. A method of testing a bumped device having a plurality of conductive bumps, comprising:

providing a test carrier having a plurality of contact pads distributed thereon and alignable with the plurality of conductive bumps;

forming an anisotropically conductive layer on the plurality of contact pads;

positioning the bumped device proximate the anisotropically conductive layer so that the plurality of conductive bumps are approximately aligned with the plurality of contact pads;

engaging the plurality of conductive bumps with the anisotropically conductive layer so that each of the conductive bumps is electrically coupled to one of the contact pads; and

applying test signals through at least some of the contact pads and the anisotropically conductive layer to at least some of the conductive bumps.

45. The method of claim 44 wherein forming an anisotropically conductive layer on the plurality of contact pads comprises stenciling an anisotropically conductive material onto the plurality of contact pads.

46. The method of claim 44 wherein forming an anisotropically conductive layer on the plurality of contact pads comprises applying an anisotropically conductive paste onto the plurality of contact pads.

47. The method of claim 44 wherein the test carrier includes a test substrate having a plurality of pockets disposed therein, the contact pads being at least partially disposed within the pockets, and wherein forming an anisotropically conductive layer on the plurality of contact pads comprises stenciling an anisotropically conductive material onto the plurality of pockets.

48. The method of claim 44 wherein the test carrier includes a test substrate having a plurality of pedestals disposed therein, the contact pads being at least partially positioned on the pedestals, and wherein forming an anisotropically conductive layer on the plurality of contact pads comprises stenciling an anisotropically conductive material onto the plurality of pedestals.

49. The method of claim 44 wherein engaging the plurality of conductive bumps with the anisotropically conductive layer so that each of the conductive bumps is electrically coupled to one of the contact pads comprises at least partially embedding the conductive bumps within the anisotropically conductive layer to force one or more conductive particles into contact to create a conductive path between each conductive bump and each corresponding contact pad.

50. The method of claim 44 wherein engaging the plurality of conductive bumps with the anisotropically conductive layer so that each of the conductive bumps is electrically coupled to one of the contact pads comprises pressing the conductive bumps against an outer surface of the anisotropically conductive layer to force one or more conductive particles into contact to create a conductive path between each conductive bump and each corresponding contact pad.

51. The method of claim 44, further comprising at least partially curing the anisotropically conductive layer.

52. The method of claim 42 wherein at least partially curing the anisotropically conductive layer comprises forming a flexible outer surface on the anisotropically conductive layer.

53. The method of claim 42 wherein at least partially curing the anisotropically conductive layer comprises forming a resilient outer surface on the anisotropically conductive layer.

54. The method of claim 42 wherein at least partially curing the anisotropically conductive layer comprises heating the anisotropically conductive layer to a temperature of at least 150° C.

55. The method of claim 44, further comprising disengaging the conductive bumps from the anisotropically conductive layer.

56. The method of claim 55 wherein disengaging the conductive bumps from the anisotropically conductive layer comprises heating the anisotropically conductive layer until the anisotropically conductive layer softens and extracting the conductive bumps from the anisotropically conductive layer.

57. The method of claim 55 wherein disengaging the conductive bumps from the anisotropically conductive layer comprises withdrawing the conductive bumps from against an outer surface of the anisotropically conductive layer.

58. The method of claim 44, further comprising monitoring an output signal from the bumped device through one or more of the conductive bumps and the anisotropically conductive layer to one or more of the contact pads.